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FIVE-YEAR RADIOGRAPHIC FOLLOW-UP OF ASYMPTOMATIC IMPACTED THIRD MOLAR TEETH WITH COMPLETED APICAL ROOT DEVELOPMENT*

APİKAL KÖK GELİŞİMİ TAMAMLANMIŞ ASEMPTOMATİK GÖMÜLÜ ÜÇÜNCÜ MOLAR DİŞLERİN BEŞ YILLIK RADYOGRAFİK TAKİBİ

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ABSTRACT

Third molar teeth can stay impacted due to systemic factors, space deficiency, pathology or an anatomical obstacle. The positions, angles, follicle sizes, and impaction statuses of impacted third molars can change over time. The purpose of this study is to investigate changes in the position, inclination, angle, and follicular width of impacted third molars at the end of a 5-year follow-up on panoramic radiographs. Retrospective analyses of a total of 98 impacted third molar teeth were carried out on panoramic radiographs taken at 5-year intervals for 31 patients who presented to the Department of Oral and Maxillofacial Radiology at Faculty of Dentistry for various reasons between 2013 and 2021.The mean angle of the examined impacted third molars with the occlusal plane was 26.725±27.31° at the beginning of the 5 -year follow-up and 26.399±28.46° at the end of the follow-up. There was a 5° angular change (inclination) in 4(8.2%) impacted molars. In the examinations of the panoramic radiographs taken at 5-year intervals, no pathologic change around any impacted third molar or resorption in neighboring teeth was observed. There were inclination changes in 2(4%) of the impacted molars and position changes in 11(22.4%).The changes may be occur in the position, inclination, angle, and follicular width of asymptomatic impacted teeth in time. It is important that asymptomatic impacted teeth can be followed radio graphically to evaluate the effects of changes in position, inclination, angle and follicle width over time on the impacted tooth and surrounding tissues and to prevent complications that may occur after a possible impacted third molar extraction.

Keywords: Impacted teeth, panoramic radiography, third molar

ÖZ

Üçüncü molar dişler; sistemik faktörler, yer darlığı, patolojik (kist, tümör vs) veya anatomik bir engele bağlı gömülü kalabilmektedir. Gömülü üçüncü molar dişlerin pozisyonları, eğimleri, folikül boyutları ve gömülü olma durumları zaman içinde değişebilir. Bu çalışmanın amacı panoramik radyografilerde gömülü üçüncü molar dişlerin 5 yıllık süreç sonunda pozisyon, eğim, açı ve folikül genişlemesinde meydana gelen değişikliklerin incelenmesidir. İnönü Üniversitesi Diş Hekimliği Fakültesi Ağız, Diş ve Çene Radyolojisi Anabilim Dalı'na 2013-2021 yılları arasında çeşitli nedenlerle başvuran 31 hastanın 5 yıl arayla çekilmiş panoramik radyografilerinde toplam 98 gömülü üçüncü molar dişin analizi yapıldı. Gömülü üçüncü molar dişlerin okluzal düzlemle açıları beş yıllık periyot öncesi ortalama26.725±27.31°; beş yıl sonrası 26.399±28.46° olarak bulundu. Gömülü üçüncü molar dişlerin 4'ünde (%8.2) 5° açısal değişim (inclination) görüldü. Aralarında beş yıl olan panoramik radyografi değerlendirmeleri sonucu hiçbir gömülü üçüncü molar diş etrafında patolojik değişim ve komşu dişlerde rezorbsiyon izlenmedi. Gömülü üçüncü molar dişerde toplam 2'sinde (%4) eğim değişimi ve11'inde (%22.4) pozisyon değişimi bulundu. Asemptomatik gömülü dişlerin pozisyon, eğim, açı ve folikül genişliğinde zaman içinde meydana gelecek değişikliklerin; gömülü diş ve çevre dokular üzerindeki etkilerinin değerlendirilmesi ve olası bir gömülü üçüncü molar diş çekimi sonrası oluşabilecek komplikasyonlardan korunmak için radyografik olarak takip edilebilmeleri önemlidir.

Anahtar kelimeler: Gömülü dişler, panoramik radyografi, üçüncü molar

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INTRODUCTION

The third molar teeth are also known as wisdom teeth, and they constitute the last four of the 32 teeth that erupt in the oral cavity. During eruption, these teeth can stay impacted due to systemic factors, space deficiency, a pathology (e.g., cyst, tumor), or an anatomical obstacle (1,2). While impacted third molars can remain asymptomatic for years, they can also have harmful effects such as pericoronitis, neoplasms, cystic lesions, resorption in neighboring teeth, periodontal diseases, and caries (3).

Panoramic radiographs are the first supplementary examination method that is used to examine the presence or absence of impacted third molars, the angles of impacted teeth that are present, their position relative to the neighboring teeth, whether there is an anatomical or pathologic obstacle on their eruption route, and their relationships with surrounding anatomical structures (1,4). Moreover, panoramic radiography has advantages such as its shorter exposure time and lower radiation dose in comparison to cone beam computed tomography (CBCT). In panoramic radiographs, the positions of impacted third molars can be classified based on the second molars adjacent to them, their depth in the mandible, their relationships to the ramus and their angles (5). These classifications have an important place in terms of understanding the position of the impacted third molar tooth and the difficulty of a potential extraction, as well as minimizing potential complications. The positions, angles, follicle sizes, and impaction statuses of impacted third molars can change over time. In their study conducted on mandibular third molars, Richardson et al. observed that during development, these teeth became more upright on the sagittal plane, while their inclination towards the medial increased or remained unchanged (6). However, there are very few studies where the radiographic follow-ups of impacted third molars were made for long periods after they completed their root development (7).

The purpose of this study is to investigate changes in the position, inclination, angle, and follicular width of impacted third molars at the end of 5-year follow-up on panoramic radiographs.

MATERIALS AND METHOD

Between 2013 and 2021, panoramic radiographs of patients admitted to the Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Inonu University for various reasons were scanned by a 1-year maxillofacial radiologist (DCO). Patients with at least one impacted third molar and adjacent second molars on both panoramic radiographs (to measure the inclination of the third molars and to assess whether there was resorption of the adjacent tooth) were identified. Radiographs of 31 patients (13 males, 18 females) aged between 22 and 65 years at the time of baseline radiographs were included in the study. The study protocol was in line with the relevant directives of the Declaration of Helsinki, and it was approved by the İnönü University Scientific Research and Publications Ethics Committee (Ethical approval number:2022/3311).

The panoramic images had been taken with a Planmeca Proline XC (Helsinki, Finland) device with the imaging settings of 18 s, 66 kVp, and 5 mA, and the images were examined using the Romexis software. While selecting the panoramic radiographs to be included, care was taken to ensure that they had sufficient quality that would not make examination difficult. Additionally, radiographs without second molars adjacent to the impacted third molar, or with severe crown damage or incomplete root development in any of the second and third molars, or pathological conditions such as cysts and tumors were excluded.

Five-year changes in the positions of 98 impacted third molars in total classified based on their inclination, angle, follicular width, and impaction status were examined on 62 panoramic radiographs obtained from 31 patients. The inclinations of the impacted third molars were classified by calculating the angles between the plane parallel to the occlusal line of all molars and the plane parallel to the occlusal line of the impacted molars. According to these angles, the categories were determined as ±10°: vertical, +11°-70°: mesioangular, -11° -70°: distoangular, and >±71°: horizontal. Using the classification made by Archer (8), the positions of the impacted third molars based on their impaction status were accepted as position A when the occlusal surface of the impacted third molar was on the same level as the occlusal surface of the second molar or higher, position B when it was between the occlusal surface and cervical line levels of the second molar, and position C when it was lower than the cervical line level of the second molar.

Statistical analysis

The data were analysed with IBM SPSS V23. Shapiro-Wilk test was conducted to test the normal distribution of the data. It was determined that the data were not normally distributed. Accordingly, Wilcoxon test was carried out. Fisher's exact tests were conducted to compare the nominal data of independent groups. McNemar -Browker test was used to compare two dependent categorical variables with three or more groups. Wilcoxon test was used to compare the position before and after. The results of the analyses were presented as frequency (percentage). Significance level was accepted as $p<0.05$.

RESULTS

In the panoramic radiographs belonging to 31 patients in total, 49 impacted teeth were observed. While 23 (41.9%) of the teeth belonged to the 13 male patients, 26 (58.1%) belonged to the female patients. Among the examined teeth, 30 (61.2%) were on the maxilla, and 19 (38.8%) were on the mandible (Table I).

Table I: Distrubition of impacted third molar according to jaws.

Jaw	n	%
Maxilla	30	61.2
Mandible	19	38.8

The mean age of the patients was 33.163±11.72 (min: 20, max: 60) at the beginning of their 5-year follow-up and 38.163±11.72 (min: 25, max: 65) at the end. The mean angle of the examined impacted third molars with the occlusal plane was 26.725±27.31° at the beginning of the 5-year follow-up and 26.399±28.46° at the end of the follow-up. The Wilcoxon test result showed no sig-

nificant difference between the first and second radiographs of the patients (p>0.05) (Table II).

There was a 5° angular change (inclination) in 4 (8.2%) impacted molars at the end of the follow-up period. This 5° change was observed in 2 teeth on the mandible and 2 on the maxilla. According to the Fisher's exact test results, the difference between the 5-year changes in the mandibular and maxillary teeth was not statistically significant (p>0.05). Moreover, this 5° change was observed in 1 tooth in the male patients and 3 teeth in the female patients. The Fisher's exact test revealed that there was no significant difference between the male and female patients in terms of the 5-year angular changes in their teeth (p>0.05) (Table III).

In the examinations of the panoramic radiographs taken at 5-year intervals, no pathologic change around any impacted third molar or resorption in neighboring teeth was observed. The number of vertical impacted teeth that was initially 21(100%) changed to 23 at the end of the follow-up, the number of horizontally impacted teeth that was initially 7 (100%) did not change, the number of mesioangular impacted teeth that was initially 10 (100%) became 9 (90%) at the end, and the number of distoangular impacted teeth which was initially 11 (100%) became 10 (90.9%) at the end.It was found that one by one decreasing tooth from groups mesioangular and distoangular was included in vertical group as 2 teeth.It was found that 100% of those with a vertical inclination 5 years ago remained vertical 5 years later. According to the McNemar-Browker test results, the inclination change rates in the examined teeth at the end of the 5-year follow-up were not statistically significant (p>0.05) (Table IV).

The number of position C impacted teeth that was initially 33 (100%) became 27 (81.8%) at the end, and the number of position B impacted teeth which was initially 16 (100%) became 10 (62.5%) at the end. According to the results of the Wilcoxon test, the position change rate of the impacted third molar teeth at the end of the 5-year period was statistically significant (p<0.05) (Table V).

Table II: Comparison of angles change at 5 year interval with wilcoxon test

	Angle	Standart deviation	Minimum	Maximum	P (value)
Initial	26.725	27.31	3.77	99.77	0.27
5 Years After	26.399	28.465	0.83	99.33	

Table III: Comparison of angular change (5°) frequency according to jaws with fisher's exact test.

	5° Angular Change		
	5° Angular Change (No)	5° Angular Change (Yes)	P
Jaws			
Mandibula	17 (89.5)	2 (10.5)	
Maxilla	28 (93.3)	2 (6.7)	0.636
Gender			
Male	22 (95.7)	1 (4.3)	
Female	23 (88.5)	3 (11.5)	0.612

*Fisher's Exact test, frequency (percent age)

DISCUSSION

In cases of pathologies in impacted third molar teeth, the requirement of surgery is beyond dispute. When there is an indication of extraction, the impacted tooth must be immediately extracted. The presence of non-restorable caries in the adjacent tooth and the impacted tooth, tooth resorption in the adjacent tooth, bone destruction, follicular disorders, or infections is a criterion for the surgical extraction of third molar teeth (9,10).

In their study with a 12-year follow-up period, Venta et al. (7) did not observe any resorption in second molar teeth associated with third molar teeth. In this study, there was also no resorption in second molars associ-

Table IV: Comparison of inclination change frequency at 5 year interval with McNemar-Browker test

	Initial				Test Statistic	p
	Vertical	Horizontal	Mesioangular	Distoangular		
5 Years After						
Vertical	21 (100)	0 (0)	1 (10)	1 (9.1)	2	0.368
Horizontal	0 (0)	7 (100)	0 (0)	0 (0)		
Mesioangular	0 (0)	0 (0)	9 (90)	0 (0)		
Distoangular	0 (0)	0 (0)	0 (0)	10 (90.9)		

*McNemar-Browker test, frequency (percentage)

Table V: Comparison of position change frequency at 5 year interval with wilcoxon test

	Initial		Test Statistic	P
5 Years Later	Position B	Position C		
Position A	6 (37.5)	2 (6.1)	-3.276	**0.001**
Position B	10 (62.5)	4 (12.1)		
Position C	0 (0)	27 (81.8)		

*Wilcoxon test, frequency (percentage)

ated with third molars.

A CBCT study reported cyst or tumor relationships in 8.6% of impacted teeth and resorption in neighboring teeth in 33.3% (11). In general, CBCT images of impacted teeth are taken to identify symptoms and before surgical operations. A previous study investigated CBCT images for impacted teeth (11). As a result of the 4-year radiographic follow-up of 55 asymptomatic third molar teeth in 34 dentistry students, Sewerin and von Woverin did not observe pathology or root resorption in any of the teeth (12). Eliasson et al. (13) performed a long-term follow-up of 1211 impacted third molars belonging to 644 patients. They identified pathologic changes at rates of 5.2% in maxillary third molars and 8% in mandibular third molars. They reported the rates of follicular enlargement as 1.04% in the maxilla and 5.85% in the mandible. They found the rates of resorption as 1% in the maxilla and 1.5% in the mandible (13). In this study, as a result of the 5-year follow-up, no follicular enlargement or pathology development was observed in any tooth. Moreover, resorption did not develop in any of the examined teeth. The reason for this may be the fact that in our study, asymptomatic impacted third molars with completed apical development were examined.

Ndiayeet al. (14) found a relationship between impacted mandibular third molars and caries and alveolar bone loss in second molars. These issues were not encountered at the end of the 5-year follow-up period in our study. The difference between our study and the study conducted by Ndiaye et al. was that we did not include teeth with caries or bone loss in their neighboring teeth in the sample.

In their study that included a 12-year panoramic radiography follow-up process, Ventaet al. (7) identified uprighting in 5 teeth on both the maxilla and mandible. In this study, no significant inclination change was found, but it was observed that a significant rate of position change occurred at the end of 5 years. It was determined that all teeth that showed such a change moved in the occlusal direction.

According to Vandeplas et al. (15), the duration of the impaction of asymptomatic impacted third molar teeth increases through age, and these teeth rarely remain without causing illness. Many clinicians consider the continued impaction of a mandibular third molar tooth a ticking time-bomb (16), but despite all these, after impacted third molar tooth surgery, complications that may be encountered include inferior alveolar and lingual nerve damage, bleeding, pain, swelling, trismus, mandibular fracture, dry socket, soft tissue injuries, tuberosity fracture, adjacent tooth damage, and displacement into the sinus and infratemporal fossa (17-19). Although Sejfija et al. (20) found the rate of pathology-related impacted tooth rate low in their prevalence study, they recommended regular follow-up of asymptomatic impacted teeth. Considering the information in previous studies presented above, in cases where impacted third molar teeth are not surgically removed, they need to be monitored.

The low number of data points and short follow-up duration in this study constituted a limitation. The potential of third molar teeth that are determined to move in the occlusal direction to cause any illness will be understood better with longer follow-ups. In addition, since three-dimensional evaluation with CBCT was not possible in this study, the initial stage of resorption, which cannot be clearly observed from panoramic radiographs, could not be evaluated.

Conclusion

Consequently, in this study, in the panoramic radiographs taken after a 5-year follow-up of impacted third molar teeth that had completed their root development, asymptomatic, and not accompanied by a disorder in surrounding tissues, it was observed that the examined teeth did not cause any pathology or root resorption. However, it would be appropriate to follow the teeth radiographically to monitor changes in tooth movement and to prevent post-extraction complications.

Conflict of interest

None declared

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